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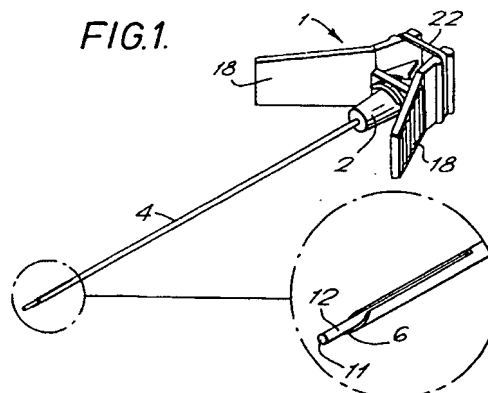
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(54) **Medical Devices.**

(57) A medical device, for example, an IV cannula or a syringe which has a hollow needle 4 with a sharp distal end 6 for piercing the skin of a patient includes means for protecting the sharp end 6 of the needle 4 after use to minimise the possibility of accidental needle stick. The means includes a rod 1 2 mounted for movement through the needle 4 between a needle end protection position and a retracted position within the hollow needle 4; and means for maintaining the rod towards the needle end protection position.



The present invention relates to medical devices and in particular to medical devices such as intravenous catheters and syringes which include a hollow needle having a sharp distal end for piercing the skin of a patient.

The existence of infectious diseases such as AIDS and hepatitis has highlighted the danger to which medical personnel may be exposed when treating patients by means of catheter devices and syringes where a sharp needle point is used to pierce the skin of the patient. Medical personnel have been infected by physical contact with or an accidental prick by an infected needle (needle stick).

In order to protect medical personnel against inadvertent needle stick a number of solutions have been developed whereby protective means incorporated within a catheter or syringe prevents physical contact with the needle after use and hence against inadvertent needle stick.

Many of the developments are complicated and involve the retraction of the needle within a housing once the needle has been used. These complications add to the expense as well as the manufacturing difficulties involved in providing adequate anti-needle stick protection.

It is an aim of the present invention to provide a simple but effective means for protecting the point of a needle forming part of a medical device such as a catheter or syringe in order to minimise the possibility of inadvertent needle stick.

According to the present invention, a medical device comprises a hollow needle having a sharpened distal end for piercing the skin of a patient and includes means for protecting said sharpened distal end after use to minimise the possibility of inadvertent needle stick, said means comprising a rod mounted for reciprocal movement through the hollow needle between a first needle end protection position at which an end of the rod is level with or extends beyond the sharpened distal end of the needle and a second retracted position in which said end is positioned within the hollow needle and spaced from said sharpened distal end and means maintaining the rod towards the first needle end protection position.

Preferably, the rod is solid although it could be hollow with a blunt distal end.

In one embodiment the needle extends from the distal end of a grip, the rod extending through the needle and the grip such that its proximal end extends beyond the grip, and means attached at or adjacent the proximal end of the rod is engageable by co-operating means for reciprocating the rod through said needle and grip.

The means attached at or adjacent the proximal end of the rod is preferably a bobbin which is engaged by two wing members, each wing member being mounted on an individual side arm, the side arms being located one on each side of the grip, the arrange-

ment being such that when the side arms are pressed together the wing members will cause the bobbin and hence the rod to move from the first to the second position.

The maintaining means may be an elastic member extending between the side arm.

In an alternative embodiment the needle extends from the distal end of a housing and the maintaining means includes a shoulder formed in the rod which in the second position of the rod engages behind a resilient collar forming part of the housing thereby preventing movement of the rod from the second towards the first position.

Preferably the rod is undercut to form the shoulder which engages behind the resilient collar located at the proximal end of the housing.

The maintaining means may include a resilient shoulder formed on an interior surface of the housing.

Embodiments of the invention will now be described, by way of example, reference being made to the Figures of the accompanying diagrammatic drawings in which:-

Figure 1 is a perspective view of an IV cannula; Figure 2 is a plan view of the IV cannula of Figure 1;

Figure 3 is a perspective view of the IV cannula of Figure 1 illustrating a cannula needle about to be inserted into the skin of a patient and including a coupling and a pair of fixation wings not illustrated in Figure 1;

Figure 4 is a plan view illustrating the position of side arm of the cannula at the moment of insertion of the needle into the skin of a patient;

Figure 5 is a side view of a medical syringe for piercing the skin of a patient to deliver a drug;

Figure 6 is a view of the syringe similar to Figure 5 but showing the syringe piercing the skin of the patient;

Figure 7 is a view similar to the views of Figures 5 and 6 but showing the drug now delivered subcutaneously;

Figure 8 is a view similar to Figure 7 with the needle tip of the syringe protected and with a part sectioned to illustrate a locking feature;

Figure 9 is an enlarged detail of the sectioned part of Figure 8;

Figure 10 is a side view in cross-section of an over-needle introducer;

Figure 11 is a side view of an anti-needle stick rod forming part of the introducer of Figure 10;

Figure 12 is a side view in cross-section similar to Figure 10 but showing the anti-needle stick rod in a second needle protection position; and

Figure 13 is a view illustrating a method of moving the anti-needle stick rod from the position illustrated in Figure 10 to the second needle protection position illustrated in Figure 12.

Referring first to the embodiment of the invention

as illustrated in Figures 1 to 4, as shown, an IV cannula 1 includes a grip 2 from which extends a hollow needle 4 having a sharpened distal end 6.

Extending through the grip 2 and the needle 4 is a solid rod 12. The rod 12 has a distal end 11 and, as shown most clearly in Figure 4, a proximal or rear end 13. Affixed at or adjacent the proximal end 13 of the rod 12 is a bobbin 16.

A pair of side arms 18 is located one on each side of the grip 2 and each carries a wing member 20 engaging the bobbin 16. Connecting the rear ends of the side arms 18 is an elastic member 22.

As shown, the inside surface 24 of each side arm 18 bears against an enlarged flange portion 26 of the grip 2 such that without any pressure being applied to the side arms 18 said side arms 18 will naturally adopt the position illustrated in Figures 1 and 2 by virtue of the force applied by the elastic member 22 to the rear ends of the side arms 18.

Before use, the cannula 1 will be as illustrated in Figures 1 and 2 with the rear ends of the side arms 18 pulled closely together and the bobbin 16 positioned flush against the rear end of the grip 2.

However, when it is required that the sharpened distal end 6 of the needle 4 pierce the skin of a patient then the side arms 18 are first pressed or squeezed together as illustrated in Figure 3 against the bias of the elastic member 22. Squeezing or pressing the side arms 18 together to the position illustrated in Figure 4 will cause the wing members 20 to move the bobbin 16 and hence the rod 12 rearwardly so that the distal end 11 of the rod 12 is retracted into the hollow needle 4 and is thereby spaced from said sharpened end 6 of the needle 4. This will allow the sharpened end 6 of the needle 4 to be used to pierce the skin of a patient.

Once the needle 4 is removed from the body of the patient and the squeezing force removed from the side arms 18 then the elastic member 22 will again apply a force to the side arms 18 bringing them back to the position shown in Figures 1 and 2. This will have the effect of the wing members 18 engaging the bobbin 16 to move the bobbin 16 and hence the rod 12 forwardly through the hollow needle 4 until the distal end 11 of the rod 12 again extends level with or beyond the sharpened distal end 6 of the needle.

A particular advantage of the embodiment described above is the simplicity of the means for protecting the sharpened distal end 6 of the needle 4 which avoids the use of complicated and expensive solutions to the anti-needle stick problem.

Referring now to the embodiment of the invention as illustrated in Figure 5 to 9, as shown, a syringe 31 for implanting a drug beneath the skin of a patient comprises a hollow needle 4' having a sharp distal end 6' extending from the distal end of a housing 34. The housing 34 comprises two parts 36, 38 integrally joined together. As shown parts 36, 38 have aligned

passages 40, 42. A drug 33 or other substance to be administered to a patient is initially located in the passage 40 of part 36.

The part 38 includes a collar 44 at its proximal end made of resilient material.

In the ready-to-use condition a rod 12' extends outwardly from the proximal end of the part 38. The rod 12' at its proximal end is provided with a button 48. Adjacent the button 48 the surface of the rod is undercut to form a rearwardly facing annular shoulder 50.

Prior to its use, the syringe 31 is provided with a detachable spacer 46 which engages around the rod 12' between the collar 44 and the button 48 to prevent accidental movement of the rod inwardly through the housing 34. In this position the distal end of the rod 12' is located in the passage 42 of the part 38 and as previously explained the drug 33 is located in passage 40 of the part 36.

In use, when it is desired to place the drug 33 beneath the skin of a patient, the spacer 46 is removed and the sharp end 6' of the needle 4' is caused to pierce the skin of the patient as shown in Figure 6.

Next pressure is applied to the button 48 causing the rod 12' to pass through the passages 40, 42 and engage the drug 33.

Further movement of the rod 12' through the passage 40 and the hollow needle 4' causes the drug 33 to pass along and out from the hollow needle 4 (Figure 7).

In its final position the distal end of the rod 12' extends beyond the sharp end 6' of the needle 4' and the shoulder 50 engages against the inner surface of the resilient collar 44 (Figures 8 and 9).

Thus, when the needle 4' is withdrawn from the skin of the patient its sharp end 6' is protected by the rod 12' thereby preventing accidental needle stick and enabling safe disposal of the syringe. Further, by virtue of the shoulder 50 engaging the inside surface of the resilient collar 44, the rod 12' is located in its needle end protection position and cannot be withdrawn from the needle to expose the sharp end 6'.

Referring now to Figures 10 to 13, an over-needle introducer 51 for positioning a catheter into the vein of a patient comprises a hollow needle 52 having a sharp distal end 53 extending from the distal end of a housing 54. As shown, the needle 52 is anchored at its proximal end within the housing 54. Located rearwardly of the proximal end of the needle 52 within the housing 54 for movement along the interior of the housing 54 is an assembly 55 comprising a rod 56, a central star-shaped member 57 and extending rearwardly therefrom an elongate striker 59. The central star-shaped member 57 is provided with serrations for aspiration and blood flash back in a manner known in the art.

The interior surface of the housing 54 adjacent its proximal end is tapered to converge towards a portion

61 with substantially parallel sides. A shoulder 63 is formed in the interior surface which separates portion 61 from an adjacent portion 65.

In use a catheter (not shown) extends over the needle 52, the skin of a patient is pierced by the sharp end 53 of the needle 52 such that the catheter is positioned in a blood vessel of the patient and the needle 52 is withdrawn leaving the catheter in place in the blood vessel, for example, a vein, in a manner known in the art. During this operation, the assembly 55 is located in the interior of the housing 54 such that the member 57 is positioned in the portion 61 with the striker 59 extending out from the rear or proximal end of the housing 54 and the rod 56 extends through a portion of the hollow needle 52 but with a gap between the sharp end 53 of the needle 52 and the distal end of the rod 56 as shown in Figure 10.

Once the needle 52 is withdrawn from the patient, the end of the striker 59 extending from the rear end of the housing 54 is struck or is caused to strike a surface (see Figure 13) such that the member 57 is forced from the portion 61 over the resilient shoulder 63 into the portion 65 such that the distal end of the rod 56 extends well beyond the sharp end 53 of the needle 52 as illustrated in Figure 12.

Thus, the sharp end 53 of the needle 52 is guarded against accidental needle stick thereby preventing the used needle 52 from inadvertently piercing the skin of the user.

The rod 56 is locked against movement back through the hollow needle 52 by the shoulder 63 engaging with the rear-facing surface of the member 57.

A particular advantage of the embodiments described above is the simplicity of the means for locking the rod 12, 12' 56 in its needle protecting position which avoids the use of complicated and expensive solutions to the anti-needle stick problem.

Although reference has been made in the above described embodiments to an IV cannula, a syringe and an over-needle introducer the anti-needle stick concept can be applied to other medical devices which involve the use of a hollow needle.

## Claims

1. A medical device comprising a hollow needle 4 having a sharpened distal end 6 for piercing the skin of a patient and including means for protecting said sharpened distal end 6 after use to minimise the possibility of inadvertent needle stick, said means comprising a rod 12 mounted for reciprocal movement through the hollow needle 4 between a first needle end protection position at which an end 11 of the rod 12 is level with or extends beyond the sharpened distal end 6 of the needle 4 and a second retracted position in which said end 11 is positioned within the hollow needle

4 and spaced from said sharpened distal end 6 and means 18,22 for maintaining the rod 12 towards the first needle end protection position.

2. A medical device as claimed in claim 1, in which the rod 12 is solid.
3. A medical device as claimed in claim 1 or 2, in which the needle 4 extends from the distal end of a grip 2, the rod 12 extending through the needle 4 and the grip 2 such that its proximal end extends beyond the grip 2, and means attached at or adjacent the proximal end of the rod 12 engageable by co-operating means for reciprocating the rod 12 through said needle 4 and grip 2.
4. A medical device as claimed in claim 3, in which the means attached at or adjacent the proximal end of the rod 12 is a bobbin 16 which is engaged by two wing members 20, each wing member 20 being mounted on an individual side arm 18, the side arms 18 being located one on each side of the grip 2, the arrangement being such that when the side arms 18 are pressed together the wing members 20 will cause the bobbin 16 and hence the rod 12 to move from the first to the second position.
5. A medical device as claimed in claim 4, in which the maintaining means is an elastic member 22 extending between the side arms 18.
6. A medical device as claimed in any one of claims 1 to 5, in which the medical device is an intravenous catheter.
7. A medical device as claimed in claim 1 or 2, in which the needle 4' extends from the distal end of a housing 34 and the maintaining means includes a shoulder 50 formed in the rod 12' which in the second position of the rod 12' engages behind a resilient collar 44 forming part of the housing 34 thereby preventing movement of the rod 12' from the second towards the first position.
8. A medical device as claimed in claim 7, in which the rod 12' is undercut to form the shoulder 50 which engages behind the resilient collar 44 located at the proximal end of the housing 34.
9. A medical device as claimed in claim 1 or 2, in which the maintaining means includes a resilient shoulder 63 formed on an interior surface of the housing 54.
10. A medical device as claimed in claim 7, 8 or 9, in which the rod 56 is connected to a striker 59 which in the first position of the rod 56 extends

outwardly from the proximal end of the housing  
54.

11. A medical device as claimed in any one of claims  
1, 2, 7, 8, 9 or 10, in which the medical device is 5  
a syringe.

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FIG.1.

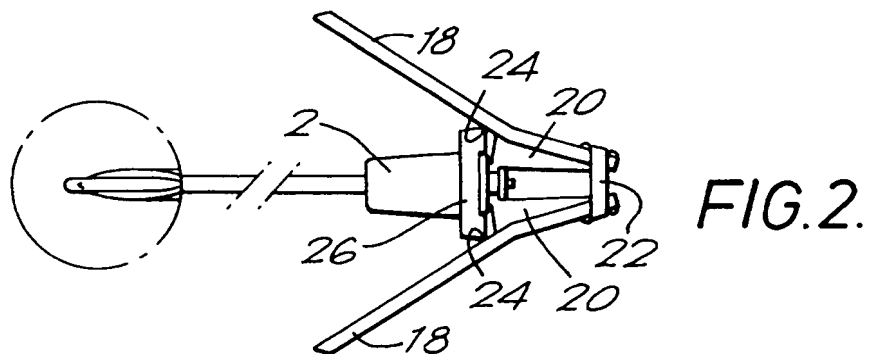
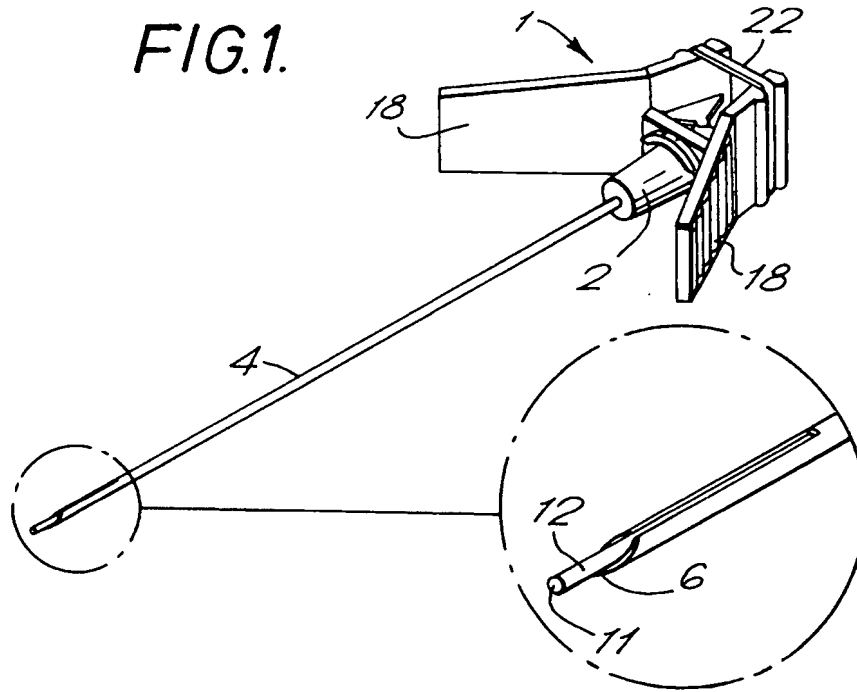
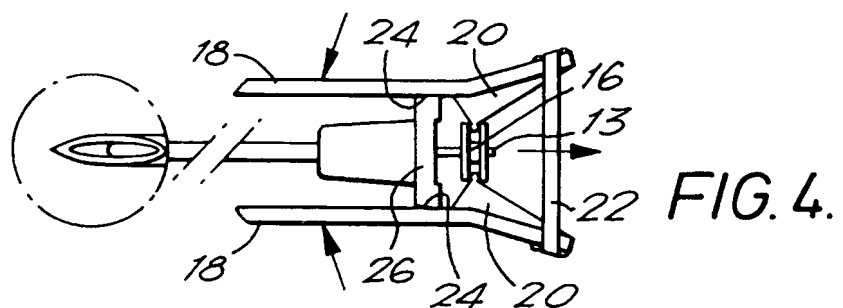
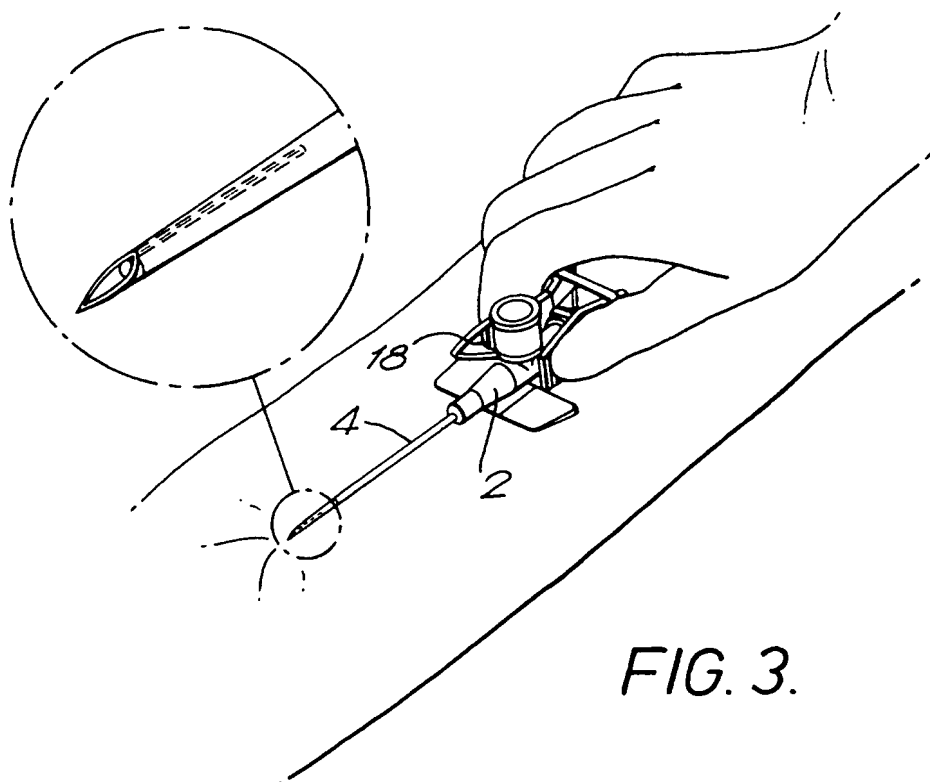


FIG.2.



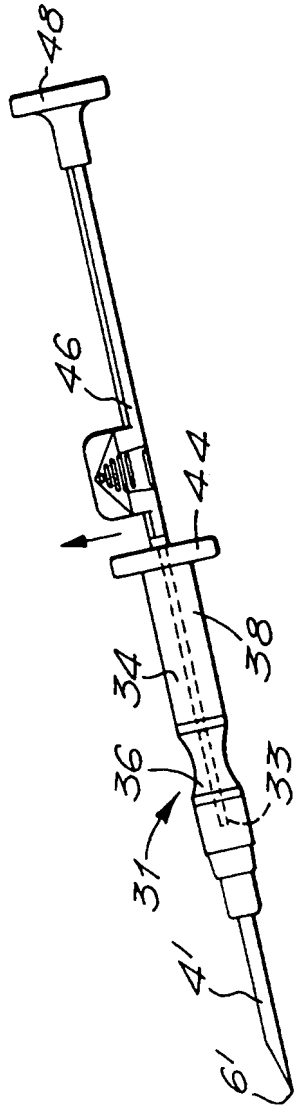


FIG. 5.

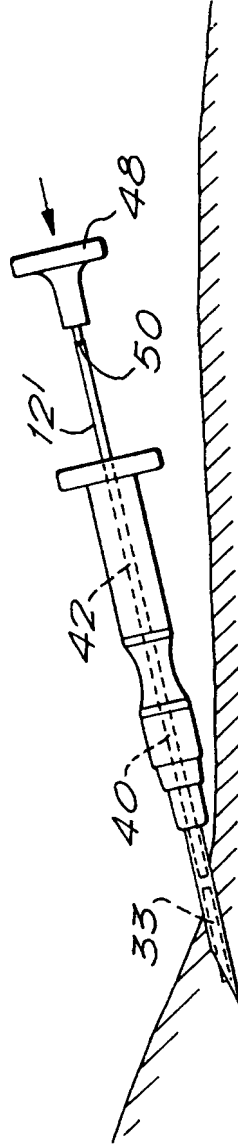


FIG. 6.

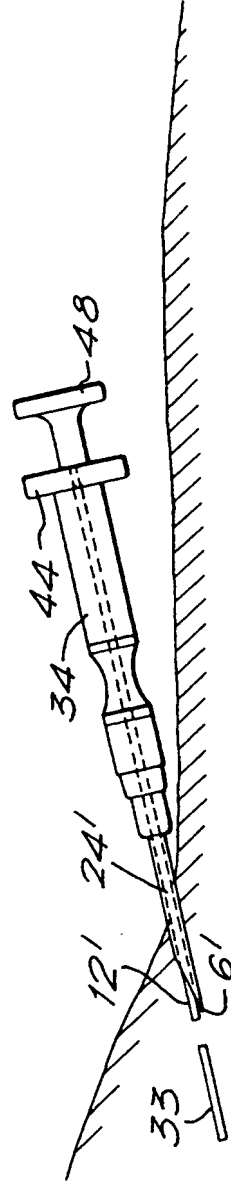
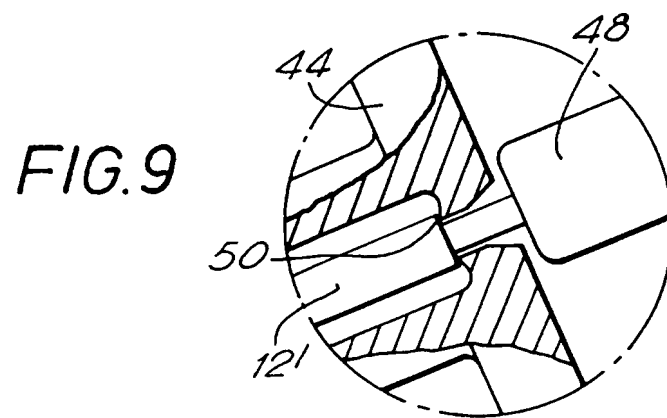
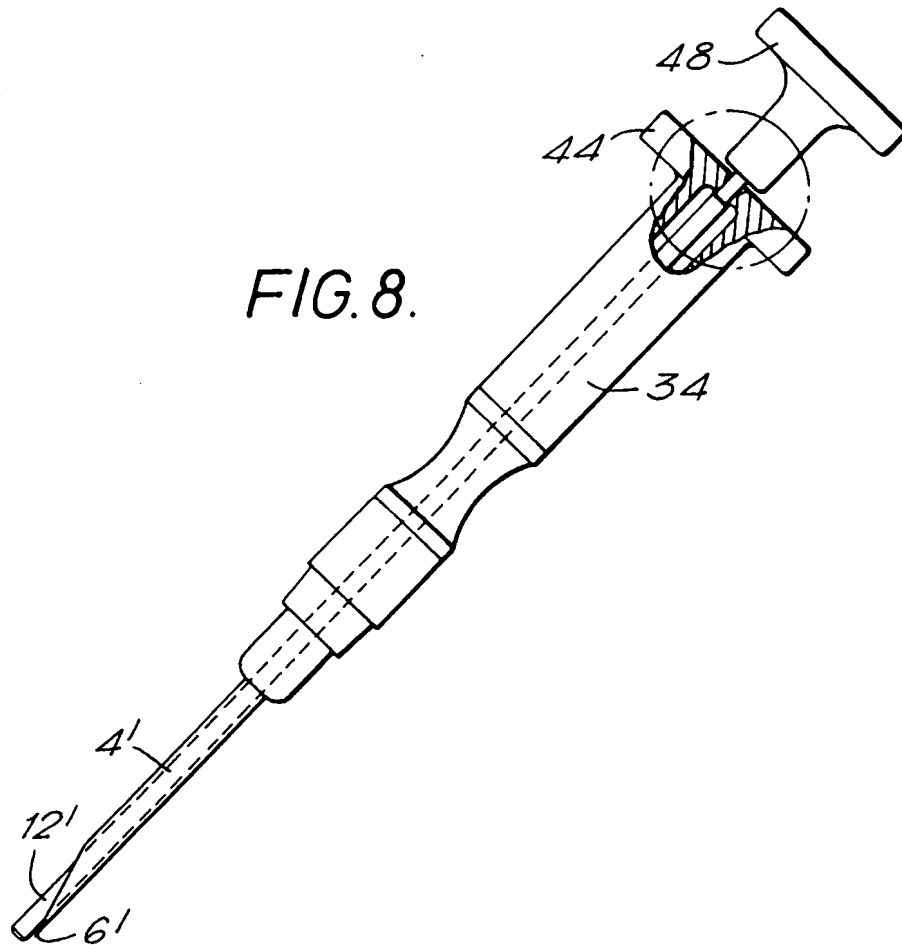
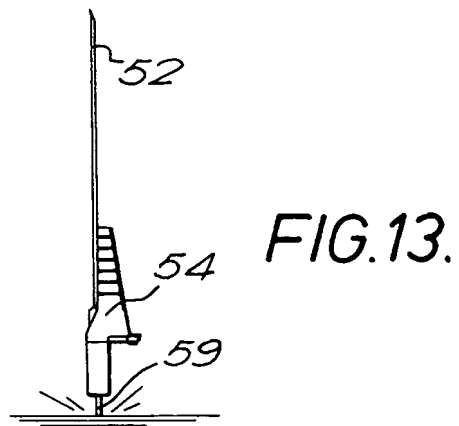
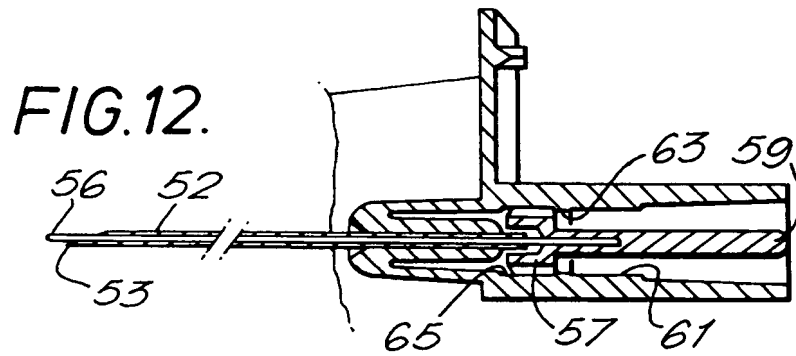
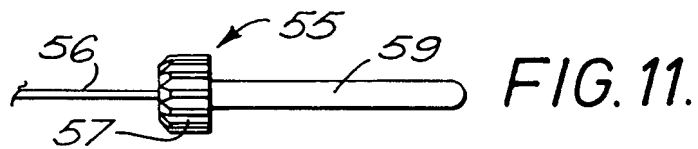
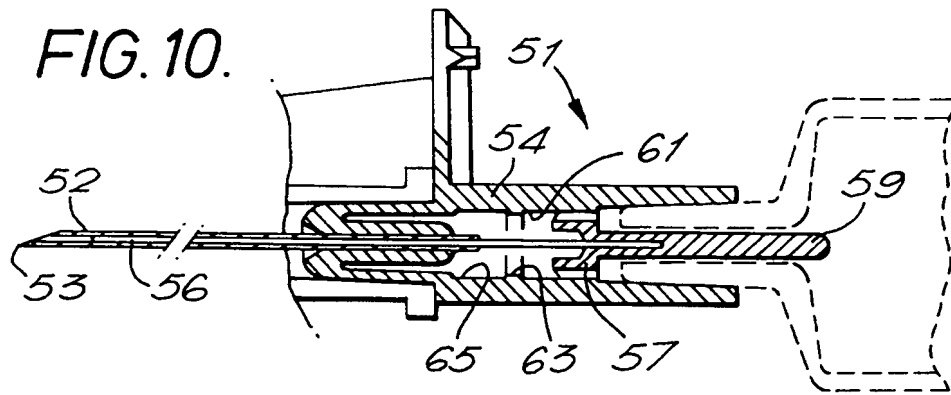


FIG. 7.









European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 94 30 9057

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US-A-4 820 267 (HARMAN) * the whole document * ---	1-3	A61M25/06 A61M37/00 A61M5/50
X	NL-A-8 901 124 (N.V. NEDERLANDSCHE APPARATENFABRIEK) * figures * ---	1,2	
X	EP-A-0 546 769 (MINNESOTA MINING & MANUFACTURIN CORP) * column 6, line 37 - column 7, line 1; figures * ---	1	
X	WO-A-89 02757 (BIO-PLEXUS) * abstract; figures * ---	1,2,11	
X	ES-A-2 023 575 (MALDONADO HERROJO) * column 2, line 38 - line 40; figures * ---	1,2,11	
X,P	US-A-5 312 345 (COLE) * the whole document * -----	1-3,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A61M A61B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 March 1995	Examiner Clarkson, P
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